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Docket No.: CH2856USPCT

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REMARKS

This response is submitted together with an appropriate Petition for Revival of an Application for Patent Abandonment Unintentionally Under 37 C.F.R. 1.137(b).

The specification is amended to correct an inadvertent error in the oxidation states of titanium and cesium. It is Ti^{3+} that causes the grey color, not Ti^{2+} . Also, it is Ce^{3+}/Ce^{4+} that is hypothesized to explain the effect of Ce on light stability, not Ce^{2+}/Ce^{4+} . The specification is additionally amended to include in the disclosure of the specification the process steps recited in claim 12 as originally filed.

The ratio of the moles of phosphorous added to the moles of aluminum added as recited in original claim 2 has been incorporated into claim 1 and claim 2 has been cancelled.

Claim new claim 15 recites the features of original claim 8 in independent claim format, incorporating the limitations of original claim 1. Consequently, original claim 8 has been cancelled.

Applicant affirms the provisional election of the claims of Group 1, claims 1-8 and 12 drawn to a process for making a water dispersible titanium dioxide pigment, with traverse.

In the Office action, claims 1-8 and 12 are rejected as obvious over U.S. Patent No. 5,785,748 of Banford et al. (hereinafter "the Banford et al. patent", in view of U.S. Patent No. 5,114,486 of Demosthenous et al. (hereinafter "the Demosthenous et al. patent").

The Banford et al. patent relates to mixing a suspension of titanium dioxide pigment with a reagent formed by reacting concentrated phosphoric acid with aluminum or an aluminum compound and adding an alkaline compound to the suspension until a pH value of at least 3.5 is achieved, but preferably a value of at least 5. The addition of the alkaline compound is said to be for depositing the aluminum phosphate, see Col. 3, lines 15-20. The Banford et al. patent additionally teaches that:

"Surprisingly, the reagent formed by reacting concentrated phosphoric acid with aluminium or an aluminium compound forms a particularly coherent coating of aluminium phosphate on the pigment particles when precipitated according to the process of the invention." See Col. 1, lines 31-35

"The reagent which is an essential feature of the invention can be formed from phosphoric acid and any aluminium compound which will react with and dissolve in the acid." See Col. 1, lines 44-46.

"After formation, the reagent generally has a relatively high viscosity and, for ease of handling, it is preferably diluted to a concentration equivalent to between 90 and 120 grams Al_2O_3 per liter before it is mixed with the suspension of titanium dioxide." See Col. 2, lines 52-56. Emphasis added

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In these passages, the patentee makes it clear that the reagent resulting from reaction of phosphoric acid and aluminum source is made in a step which is separate from the step in which the source of aluminum and phosphorus are applied to the titanium dioxide pigment. This is additionally supported by the requirement of the Banford et al. patent to use an alkaline compound during formation of the reagent and then to again use an alkaline compound when the reagent is contacted with the pigment in order to apply the aluminum phosphorus coating, see Col. 3, lines 15-20.

In contrast, the claimed process forms a mixture of titanium dioxide pigment, water and sodium hydroxide then adds, to that mixture, phosphoric acid and sodium aluminate either simultaneously (as recited in claim 1) or sequentially (as recited in new claim 15). If a reagent similar to the reagent of the Banford et al. patent forms it would be formed in situ. The process of the instant claims avoids the multi-step process, described in the Banford et al. patent, of first forming the reagent (and dealing with the handling problems associated with its high viscosity, see Col. 2, lines 52-56), separately forming the suspension of titanium dioxide then combining the suspension with the already formed reagent. Since the instant process does not first form a reagent, but instead adds the phosphoric acid and sodium aluminate as raw material ingredients, the problems associated with handling a high viscosity reagent are avoided as well as the inefficiencies of carrying-out a multi-step process. This is not, however, to be taken as implying that it has been shown that the claimed process would even produce an identical product.

The Banford et al. patent additionally adjusts the pH to a value of at least about 3 by the addition of an alkaline compound after the aluminium phosphate reagent is mixed with the suspension of titanium dioxide pigment, see Col. 2, lines 4-10. In contrast, the process of claim 1 maintains the pH of the mixture by controlling the rate of simultaneous addition of the phosphoric acid and sodium aluminate.

New claim 15 further distinguishes the instant process from the disclosure of the Banford et al. patent by requiring the sodium aluminate to be added after the phosphoric acid solution is added. Moreover, in new claim 15, the solution of the sodium aluminate is added in an amount sufficient to raise the pH of the mixture of titanium dioxide and phosphoric acid to a pH of 7.

The Office action points to the teaching of the Demosthenous et al. patent to provide the suggestion or motivation to add a mineral acid to maintain the pH to arrive at the conclusion that it would have been obvious to modify the disclosure of the Banford et al. patent by adding hydrochloric acid wherein the rate of addition of aluminate solution and that of the acid solution is adjusted so that the pH of the resulting mixture is in a range of from 5 to 8. However, nothing in the Demosthenous et al. patent would have motivated the person of

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In view of the foregoing, allowance of the above-referenced application is respectfully requested.

Respectfully submitted,



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ordinary skill in the art to ignore the teaching in the Banford et al. patent to form a reagent for coating the pigment particles.

The Office action rejects original claim 2 as obvious on the grounds that the claimed molar ratios would have been obvious to one of ordinary skill in the art at the time of the invention through routine experimentation with the goal of optimizing the method for the manufacture of titanium dioxide pigment. The Office action states that the Banford et al. patent does not specifically disclose the ratio of moles of phosphorous added to the moles of aluminum added. It is important to clarify that the Banford et al. patent discloses the ratio of moles of phosphorous added to moles of aluminum added in the reagent. See Banford et al. at Col. 2, lines 30-32:

“reacting aluminium hydroxide with concentrated phosphoric acid in a molar ratio of aluminium to phosphorus of 1:2 to 1:5 Al:P”

Converting this ratio to P:Al, for the sake of comparison with the claimed process, the P:Al ratio of the reagent is 2:1 to 5:1. In contrast, the claimed added P:Al ratio is much lower; that is, about 0.2 to 0.9 (which means about 0.2:1 to 0.9:1).

The Banford et al. patent teaches a surface coating of aluminum phosphate in which the molar ratio of aluminium to phosphorus lies in the range 1.8:1 to 1:1.4 Al:P, which converts to 0.55 to 1.4 in terms of P:Al, which is very much lower than the 2:1 to 5:1 P:Al ratio of the reagent. In contrast, the P:Al ratio of the product, resulting from the aluminum phosphate surface treating addition, would be very close to that amount which is added and, thus, would be close to about 0.2:1 to 0.9:1.

In order to further prosecution and more particularly point out and distinguish the present process for making water dispersible titanium dioxide pigment from the Banford et al. patent and the Demosthenous et al. patent, however, the claims have been limited to the ratio of phosphorous added to the moles of aluminum added which is from about 0.2 to 0.9.

Moreover, the claims have been limited to a surface treatment consisting essentially of aluminum phosphate, in order to exclude zinc while not excluding the other components or ingredients that do not materially affect the basic and novel characteristics of the invention.